PATENT

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Signature

Application No.	:	10/821,266	Confirmation No. 8622
Applicant	:	Tae-Ill Yoon, et al.	
Filed	:	April 8, 2004	
Title	:	CARBON-BASED COMPOSITE PARTICLE FOR ELECTRON EMISSION DEVICE, AND METHOD FOR PREPARING	
TC/A.U.	:	2879	
Examiner	:	Karabi Guharay	
Docket No.	:	51821/P849	
Customer No.	:	23363	

DECLARATION UNDER 37 CFR § 1.132

Mail Stop Amendment
Commissioner for Patents
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June 14, 2007

Commissioner:

I, Tae-Ill Yoon, hereby declare that:

1. I received a Bachelors degree in Ceramic Engineering from Yonsei University, and a Masters degree in Ceramic Engineering from the Graduate School of Ceramic Engineering at Yonsei University. I have been employed by Samsung SDI Co., Ltd. since 1985. My responsibilities have included research and development of anti-reflective coating materials for shielding electromagnetic fields for CRTs from 1996 to 1998, research and development of super pigment phosphors for CRTs in 1999, research and development or high contrast glass devices in 2000, and most recently, research and development of FED emitter devices from 2002. I am the first-named inventor in the above-identified patent application.

2. I have studied the disclosure of U.S. Patent No. 6,239,547 which issued to Uemura et al. ("the Uemura patent") and which has been cited against the pending application.

The Uemura patent discloses an electron emission source in which a "bundle paste" comprising needle-like bundles of carbon and metal particles is applied to a plate to form an emitter having a plurality of the bundles at least partially extending from a bed of the discrete metal particles. (See the Uemura patent, column 11, line 62 to column 12, line 9 and Fig. 7 E.)

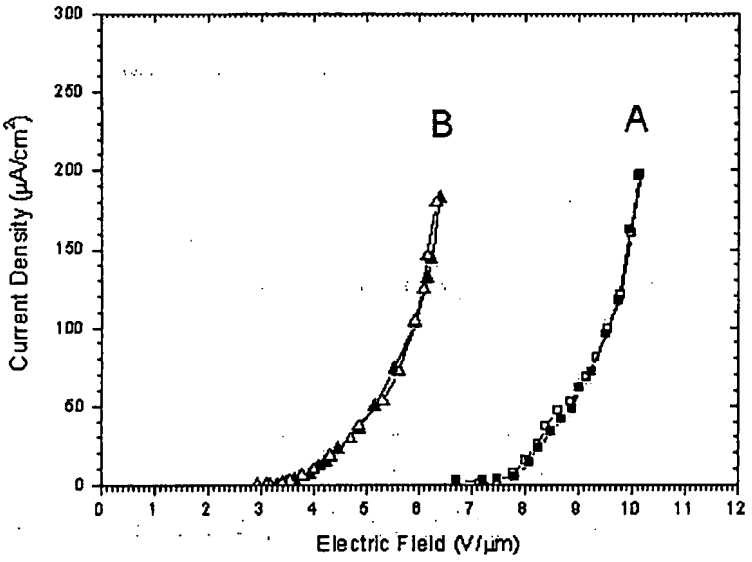
3. Unlike the Uemura reference, according to the present invention, discrete metal particles are formed with carbon particles extending from their surface. (See independent claims 1 and 8.) The particles of the present invention are not only physically different from the particles disclosed by the Uemura reference, they have improved properties as established by the following experiments where Example A sets forth an electron emission source made according to the disclosure of the Uemura patent and Example B sets forth an electron emission source made according to the presently claimed invention.

4. For Example A, 20 g of Ag metal powder (with particles about 1 um diameter), 5 g of carbon nanotubes, 20 g of glass frit (about 1 um diameter), 20 g of solvent, and 45 g of organic material including a binder polymer were mixed. The mixture was treated by ultrasound, and dispersed to obtain an electron emission source paste. The paste was screen-printed on a substrate and dried, exposed to light, and developed to form an emitter with a predetermined pattern. The emitter was then sintered at 400°C for 15 minutes under an oxygen atmosphere to remove organic material from the emitter and to solidify it on the substrate. A YAG laser at a voltage of 500 V, about 1.0 J, and an interval of 0.6 ms was scanned on the surface of the emitter to expose the CNT.

5. For Example B, 85 g of $AgNO_3$, 4 g of NH_4OH, 5 g of $NaBH_4$, and 5 g of carbon nanotubes were mixed and sintered at 400°C to obtain Ag-CNT composite particles. The composite particles were mixed with an appropriate amount of a solvent, a binder polymer, etc., and were dispersed to provide a paste composition. The paste was screen-printed on a substrate and dried, exposed to light, and developed to form an emitter with a predetermined pattern. The

emitter was sintered at 400°C for 15 minutes under a nitrogen atmosphere to remove organic material from the emitter and to solidify it on the substrate.

6. Current density as a function of electric field was measured for the electron emission sources of Examples A and B. The results of the electron emission measurements are summarized in the following table which illustrates that the electron emission source of the present invention has surprisingly superior electron emission characteristics over the device of the Uemura reference.



7. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States

Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: June 11, 2007

By: T. I. YOON
I, Tae-Ill Yoon

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